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ABSTRACT

Objectives: *Sources of obtaining credible evidence-based nutrition knowledge appears to be more and more limited as nutrition information becomes widespread. The purpose of this study was to determine sources of nutrition information and corresponding nutrition-related behaviors among Florida residents.*

Study Design: *A cross-sectional study.*

Methods: *A telephone survey was conducted using probability sampling with residents of Florida in October 2017.*

Results: *A total of 611 respondents completed the survey from 45 different counties across Florida. A significant relationship was established between age and primary source of obtaining nutrition information. Young, middle age and elderly adults preferred media, registered dietitians and physicians/nurses respectively. Generally, media was the predominant source of obtaining nutrition information (37% of respondents). A majority (72%) of respondents reported they have not received recent formal nutrition education. Yet those who did report recent nutrition education reported protein from plant-based sources was more important to healthy eating than fruits and vegetables. Males and those less than 54 years old were more likely to perceive their diet as less than healthy.*

Conclusions: *Health professionals and health educators are tried with the challenge of de-bunking false nutrition information and providing the public with factual nutrition education. Delivery of the research-based dietary recommendations needs to be consistent, factual and across multiple mediums. Further research needs to be conducted with a larger sample size from states other than just Florida on these nutrition-related behavior questions.*

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BACKGROUND

Americans are aware that nutrition affects health. (Gamble, 2008) Despite this, 71.6% of adults over the age of 20 are considered overweight, of which 39.8% are obese. (CDC, 2016) Obesity is mechanistically involved with the pathology of heart disease, stroke, type 2 diabetes and some types of cancer; all of which are within the top ten leading causes of death in the United States. (CDC, 2018) Recent data suggests that six in ten Americans had at least one chronic disease, of which four of those had more than one. There is a steep upwards trend of healthcare expenditures, from two to fourteen-fold, for an individual with a number of chronic diseases compared to a healthy individual. (Buttorff., Ruder., & Bauman., 2017) Globally poor dietary habits rank ahead of smoking as the leading cause of deaths from chronic diseases. Excessive sodium intake and low consumption of whole grains and fruits are major dietary factors contributing to these problems. (Afshin et al., 2019) These lifestyle decisions have the potential to be mediated through proper nutrition education.

A lack of proper nutrition education and health literacy appears to be on the same trajectory of the rise of chronic disease in the United States. (Mackert, Mabry-Flynn, Champlin, Donovan, & Pounders, 2016) Americans believe that they are cognizant of the link between nutrition and chronic disease, yet there is still an overwhelming obesity issue and diet quality remains poor. (Aspry et al., 2018; Guthrie, Derby, & Levy, 1999) As these entities are closely tied, it is interesting to learn where most Americans turn to receive information. A nationwide survey presented media (internet, television, magazines) as the most popular sources of nutrition information yet deemed lacking credibility by respondents. At the same token, these respondents rated registered dietitians, doctors, and nurses as very credible sources of nutrition information, yet limitedly sought them out. (*Nutrition and You: Trends 2011*, 2011) Misinformation can easily propagate through the internet due to a lack of fact-checking, and it has become increasingly important to ensure people can decipher the quality of sources. Superimposed with this, marketing and advertising of food companies have negatively impacted dietary intake. (Zimmerman & Shimoga, 2014) Fast food restaurants have increased money spent on advertising with spending $4.6 billion in 2012. (Harris et al., 2013) Processed, nutrient-poor foods have a strong presence in grocery stores as well.

According to a recent study, a majority of Americans food purchases consist of highly processed sources. (Poti, Mendez, Ng, & Popkin, 2015) These foods prevail when competing with healthy, wholesome options, and the companies behind them are spending more resources to market their products and reach consumers.

Purpose

Dietary intake is being negatively impacted by marketing and advertising by food companies and the public relying on less than optimal sources for nutritional information. At the root of chronic disease, complications are diet and lifestyle factors, where nutrition education can make an impact on the prevention and treatment of these diseases. Dietary education may be a viable method, which can help achieve weight loss and a corresponding decline in chronic disease risk. (Dansinger, Tatsioni, Wong, Chung, & Balk, 2007; Torres, Ferreira, Nogueira, Nascimento, & Sanjuliani, 2011) Therefore, the purpose of this study is to determine if there is a relationship between sources of nutrition information, knowledge and health-related behaviors of Florida residents.

METHODS

Participants and Procedures

A total of 611 Florida residents were surveyed for this study. The margin of sampling error for the total sample is +/- 3.96%. The survey was conducted by live callers (undergraduate and graduate students) at the UNF Public Opinion Research Laboratory (PORL), via the telephone daily from October 5 through October 11, 2017. Interviews were conducted in English and Spanish using a computer-assisted telephone interviewing software. The sample of phone numbers was created through the voter file provided by Florida's Division of Elections' September 2017 update and selected through the use of probability sampling among registered voters in the state of Florida.

A single interviewer, through hand dialing, upon reaching the specific registered voter as identified in the Florida voter file, asked the respondent to participate. The total sample was then weighted by partisan registration, sex, race, age, and education. Partisan registration, sex, race, and age weights were created from the September 2017 update of the Florida voter file to match the active registered voters in Florida. These demographic characteristics were pulled from the voter file list. Education weights were created from the 2016 American Community Survey (ACS).

The PORL is a full-service survey research facility that provides tailored research to fulfill each client's individual needs from political, economic, social and cultural projects. The PORL opened in 2001 and is an independent, non-partisan center, a charter member of the American Association for Public Opinion Research Transparency Initiative and a member of the Association of Academic Survey Research Organization. For more information about methodology, contact Dr. Michael Binder at porl@unf.edu or at (904) 620-2784.

Measures

The questions of interest for this article were adapted from a recent national survey, along with self-developed questions of interest. Questions 3, 5, and 9 were adapted from the American Dietetic Association's Nutrition and You: Trends 2011 survey. (*Nutrition and You: Trends 2011*, 2011) The survey asked participants about their history with nutrition education, sources of obtaining nutrition knowledge, nutrition-related behaviors and overall view of personal health. The survey was refined based on pretesting with a convenience sample (n=5) of health professionals and students.

Use of skip logic was employed to direct the participants through different paths of the questions, based on their answers. The survey included a total of 10 questions, of which question order was not randomized due to the use of skip logic. Participants were able to select one or more responses, depending on the question. This section of the PORL survey took less than five minutes to complete.

Data Analysis

Data were analyzed using SPSS v24 for Windows. All weighted demographic variables were applied using the SPSS version 23 rake weighting function. There were no statistical adjustments made due to design effects. Participants socio-demographic information and responses to questions were examined using descriptive statistics, chi-square tests and regression analyses (logistic and hierarchical linear). Control variables of age, race, and gender were taken into account.

RESULTS

Descriptive statistics for all control, independent, and dependent variables are available in Table 1. Because of uneven distributions, some variables were recorded to improve interpretability. The survey was able to recruit at least one participant from 45 of Florida's 67 counties (M = 13.76 per county). A plurality of participants (12.8%) were from Dade county (n = 79). The top eight counties (i.e., Dade, Broward, Palm Beach, Brevard, Hillsborough, Orange, Pinellas, and Sarasota) comprised 52.7% of the sample (n = 326).

The results of the hierarchical logistic regression revealed that there was a significant relationship between recent nutrition education and most important food for healthy eating ($\chi^2(6) = 12.60$, $p = .05$). Participants that had recently received nutrition

education were disproportionately more likely to report that getting protein from plant-based sources was the most important factor to healthy eating and disproportionately less likely to report that eating fruits and vegetables was the most important factor to healthy eating. No such difference was identified for avoided foods (p = .748). However, regression analysis (see Table 2) did show that, on average, participants who had recently received nutrition education avoided .162 more foods than participants who had not (p = .03, ΔR^2 = .01) after controlling for age, race, and gender.

Chi-square tests found no significant relationship between county and recent nutrition education (p = .40) or primary source of nutrition knowledge (p = .61). Another test revealed a statistically significant relationship between age and recent nutrition education ($\chi^2(5) = 16.30, p < .01$). Participants age 35-44 and 55-64 were disproportionately more likely to report recent nutrition education. A statistically significant relationship was seen between age and primary source of nutrition knowledge ($\chi^2(20) = 34.77$, p = .02). Participants age 18-24 were disproportionately more likely to report receiving their nutrition education from media sources while both 35-44 and 65+ year old were disproportionately less likely to report receiving their nutrition education from media. Participants age 35-44 were also disproportionately more likely to report receiving their nutrition education from a registered dietitian. Meanwhile, participants 65 or older were disproportionately more likely to report receiving their nutrition education from a nurse or physician.

No significant difference was found between people with hypertension and those without healthy diet behavior (p = .335). However, the overall model (see Table 3) was statistically significant ($F(4) = 4.132$, p = .003). Males, on average, self-rated .20 points higher (i.e., more disagreement that they have a healthy diet) than females. Also, participants age 55+ scored .23 points lower (i.e., more agreement that they have a healthy diet) than participants age 54 or less. While holding age, race, and gender constant, healthy diet behavior was a significant independent predictor of healthy diet perception (p = .001, ΔR^2 = .02). For every one-unit increase in healthy diet behavior (i.e., more disagreement that they have a healthy diet), the odds of participants reporting that their diet was healthier today than last year decreased by 74%.

Table 1

Descriptive Statistics for All Variables

Variable	M (n)	SD (%)
Gender		
Female	(337)	(55.7)
Male	(268)	(44.3)
Race		
Asian/Asian Pacific Islander	(15)	(2.4)
Black non-Hispanic	(67)	(10.8)
White non-Hispanic	(411)	(66.4)
Hispanic	(90)	(14.5)
Multiracial	(10)	(1.6)
Other	(9)	(1.5)
Unknown	(17)	(2.7)
Race[b]		
White	(411)	(66.4)
Non-White	(208)	(10.8)
Age[c]		
< 55	(292)	(47.2)
≥55	(327)	(52.8)
Age[d]		
18-24	(57)	(9.2)
25-34	(79)	(12.8)
35-44	(68)	(11.0)
45-54	(88)	(14.2)
55-64	(105)	(17.0)
≥65	(222)	(35.9)

Hypertension Diagnosis		
Yes	(226)	(36.7)
No	(389)	(62.8)
Missing	(4)	(0.5)
Primary Concern[e]		
Salt	(87)	(38.5)
Weight	(49)	(21.7)
Fat	(19)	(8.4)
Sugar	(16)	(7.1)
Medications	(22)	(9.7)
Other	(30)	(13.2)
Missing	(3)	(1.3)
Label Reading		
Always	(282)	(45.6)
Sometimes	(214)	(34.6)
Rarely	(73)	(11.8)
Never	(46)	(7.4)
Missing	(4)	(0.6)
Label Reading[b]		
Always	(282)	(45.6)
Less than Always	(333)	(53.8)
Missing	(4)	(0.6)
Recent Nutritional Education		
Yes	(163)	(26.3)
No	(445)	(71.9)
Missing	(11)	(1.8)
Most Important Factor to Healthy Eating		
Fruits and Vegetables	(315)	(50.9)
Dairy	(10)	(1.6)
Animal Protein	(70)	(11.3)
Plant Protein	(77)	(12.4)
Grain	(35)	(5.7)
Other	(26)	(4.2)
Missing	(86)	(13.9)
Source of Nutrition Knowledge		
Media	(229)	(37.0)
Registered Dietitian	(43)	(6.9)
Nurse or Physician	(169)	(27.3)
Family and Friends	(65)	(10.5)
Other	(37)	(6.0)
Missing	(76)	(12.3)
Healthy Diet Perception Compared to Last Year		
Diet is more healthy	(300)	(48.5)
Diet is same or less healthy	(317)	(51.2)
Missing	(2)	(0.3)
Number of Avoided Foods	1.30	.61
Healthy Diet Behavior	1.90	.92

Notes: [a]"County" variable not included in table due to space, [b]Version of variable included in all analyses, [c]Version of variable used as control variable, [d]Version of variable used as independent variable of interest, [e]Only asked to those with hypertension

Table 2

Linear Regression Analysis for Healthy Eating Behavior

Variable	B	*SE B*	β
Constant	1.30**	.07	
Age (ref: < 55)	-.113	.07	-.09
Race (ref: Non-white)	.054	.08	.04
Gender (ref: Female)	-.089	.07	-.07
Recent Nutrition Education (ref: No)	.162*	.07	.126
Adjusted R^2		.02	
SEE		.60	
F		2.34*	

Notes: * = $p \leq .05$; ** = $p < .001$

Table 3

Linear Regression Analysis for Healthy Dietary Behavior

Variable	B	*SE B*	β
Constant	1.97**	.17	
Age (ref: < 55)	-.227*	.08	-.123
Race (ref: Non-white)	.146*	.08	.074
Gender (ref: Female)	-.201	.08	.108
Hypertension Diagnosis (ref: No)	-.08	.08	-.04
Adjusted R^2		.02	
SEE		.914	
F		4.13*	

Notes: * = $p \leq .01$; ** = $p < .001$

DISCUSSION

Despite the strong evidence that nutrition and lifestyle significantly impact health and chronic disease risk, lack of proper nutrition education and corresponding unhealthy dietary patterns continue to exist. Each day, a person is faced with many dietary choices, that may contribute either positively or negatively to their health outcomes. The present study revealed the sources of obtaining nutrition information and corresponding dietary behaviors were varied across age groups and genders.

By a large margin, media has been reported to be the highest rated source of obtaining nutrition information. Sources of obtaining nutrition information were shown to have varied by age groups. Young adults reported receiving nutrition information from the media, middle age adults from registered dietitian and elderly adults from other healthcare professionals such as a nurse or physician. Previous literature lacks the distinction among age groupings, making these findings unique. (Nelson, Stewart, Frankel, Strowman, & Edelstein, 2015; *Nutrition and You: Trends 2011*, 2011) The unfiltered world-wide-web allows any person or professional to post and/or share nutrition information. Media has shown an array of contradictory information available, resulting in nutrition confusion and potential for backlash in nutrition behaviors. (Lee, Nagler, & Wang, 2018) The fact that media is the preferred source for nutrition information illuminates a public health concern.

Changes in health behaviors depend on many factors including personal health beliefs, abilities, self-efficacy, resources, habit and choice. (Glanz, Rimer, & Viswanath, 2008) The results from this study indicate when a person chooses to make healthy dietary behaviors, they are more likely to perceive themselves as healthy. This optimistic mindset can lend forth to show a positive portrayal of health messages can help facilitate healthy behaviors. These data show an association between those who recently received nutrition education were more likely to report plant-based protein as a more critical factor to a healthy diet compared to fruits and vegetables. While various health benefits have been shown when a person consumes a higher plant-based diet, there is equal or greater value to fruits and vegetables. (Satija et al., 2016; Wang & Beydoun, 2009). There are several health-related claims, both in media and on consumer websites, that positively associate plant-based protein, nutrition, and general health. These findings support the fact that individuals who have gained knowledge of nutrition are making more

conscious nutrition choices yet may not be understanding the full picture of the necessary components to a healthy diet.

This study had several limitations that need to be addressed. There is a restriction that is placed on the data collection method of telephone surveys. Although phone numbers were taken from registered voters, this may result in bias due to individuals who participated may be more interested in the subject matter. Secondly, although this study is a representative sample of Florida residents, results cannot be generalized to other states. Third, this study included only quantitative methods, in which a more qualitative approach would have provided more in-depth reasoning to their answers. Lastly, the information collected was self-reported behaviors, which may not accurately represent the reality of the situation.

IMPLICATIONS FOR PUBLIC HEALTH

This study demonstrated people, varied by age, obtain nutrition information from different sources. This study's findings raise the concern that individuals are seeking non-nutrition professionals for their nutrition information and education, resulting in a potential recoil in nutrition behaviors. An array of misinformation may be happening, and future research needs to delve into details of what online sources people are learning nutrition information. Moreover, if that information or misinformation leads to a backlash in nutrition-related behaviors. In a world with the internet and media access at the tip of our fingers, researchers need to investigate the relationship between nutrition information hosted on media outlets and its corresponding nutrition-related behaviors beyond the Florida borders.

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